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Method for Calculating Costs of Underground Storage Tank Closure at Fort Dix, NJ

by
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Fort Dix's current Realignment Project requires a reorganization and restructuring of the installation that will reduce in size or eliminate some facilities in the cantonment, which contain 23 USTs.

This study investigated conditions and regulations affecting UST closure, and devised a method to estimate closure costs. The estimation calculation accounts for retaining or removing the tanks, and includes adjustments for different tank sizes and for tanks located either singly or in groups on an individual site. Individual, total, and average closure costs were estimated for 13 of the 23 USTs in the Fort Dix cantonment area.

The cost calculation methods outlined here were found to be accurate and may be useful to estimate closure costs of USTs at other Army installations or in the private sector.

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FOREWORD

This study was a USACERL initiative using data derived from two related primary studies. The first study was performed for the U.S. Army Engineering and Housing Support Center (USAEHSC) under Project 4A162720A896, "Base Facility Environmental Quality"; Work Unit A0-032, "Treatment Technology for Hazardous Waste." The second study was performed for Headquarters, U.S. Army Training and Doctrine Command (HQTRADOC), under Project RD0P69MOY9, "Facility Layaway Procedures."

This work was performed by the Environmental Division (EN) of the U.S. Army Construction Engineering Research Laboratory (USACERL). The Principal Investigator was Kemal Piskin. Special gratitude is owed to Bernard A. Donahue, the Environmental Engineering team leader, for his technical support of the project. Dr. Edward W. Novak is Acting Chief, USACERL-EN. The USACERL technical editor was William J. Wolfe, Information Management Office.

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METHOD FOR CALCULATING COSTS OF UNDERGROUND STORAGE TANK CLOSURE AT FORT DIX, NJ

1 INTRODUCTION

Background

With the passage of the 1976 Resource Conservation and Recovery Act (RCRA) and the Hazardous and Solid Waste Amendments (HSWA) in 1984, the U.S. Environmental Protection Agency (USEPA) was directed to develop an Underground Storage Tank (UST) program. The USEPA finalized these UST regulations in September 1988.[1] The program outlines rules and regulations for both existing and new USTs, including technical standards for tank design, installation and operation, and requirements for leak detection and prevention. The program also states requirements for financial responsibility and necessary corrective action for all USTs containing regulated substances.

The new rules also impose minimum requirements for each UST system, for both tanks and their piping. USTs must be equipped with leak detection devices, must be protected from corrosion, and must have a protective device to prevent spills and overfills. Since these regulations (and the costs they incur) apply to both new and existing facilities, they affect Army installations that have USTs, and impact their decisions to keep USTs in place, to temporarily or permanently close them, or to remove them entirely.

In 1987, USACERL developed a microcomputer-based UST database system[2] to manage and track large numbers of Army USTs, including a leak potential index (LPI) to rank an installation's USTs by their potential for leakage. USACERL gathered the following UST information: installation name; specific address (locations where tanks are located); tank identification; and each tank's: (a) status, (b) age, (c) construction materials, (d) capacity, (e) internal and/or external corrosion protection, (f) substance stored, and (g) piping information. Some soil information (e.g., pH, salinity, permeability, and shrink/swell value) was obtained from the Soil Conservation Service (SCS) database, maintained at Iowa State University.

Recently, USACERL updated the UST database by surveying Army installations, including Fort Dix, NJ. The U.S. Army Training Center at Fort Dix (Figure 1) includes a number of oil and motor fuel storage tanks, some installed above, and some below ground.[3] Fort Dix's current Realignment Project calls for a reorganization and restructuring of the installation, which will reduce in size or eliminate several facilities in the cantonment area (Figure 2), some of which include a number of USTs. In such cases, there is a need for a method to calculate costs of UST closure that accounts for recent changes in environmental regulations, including the responsibility for cleanup after a possible spill during closure.

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[1] Code of the Federal Register Part II, 40 CFR Parts 280-281:37081-37247, *Underground Storage Tanks: Technical Requirements and State Program Approval: Final Rule* (September 1988).

[2] Bernard A. Donahue, T.J. Hoctor, and Kemal Piskin, *Managing Underground Storage Tank Data Using dBASE III Plus* Technical Report (TR) N-87/21/ADA182452 (U.S. Army Construction Engineering Research Laboratory [USACERL], June 1987).

[3] *TRADOC Installation Guides*, TRADOC Pamphlet No. 210-1 (Army Training and Doctrine Command, 1981).

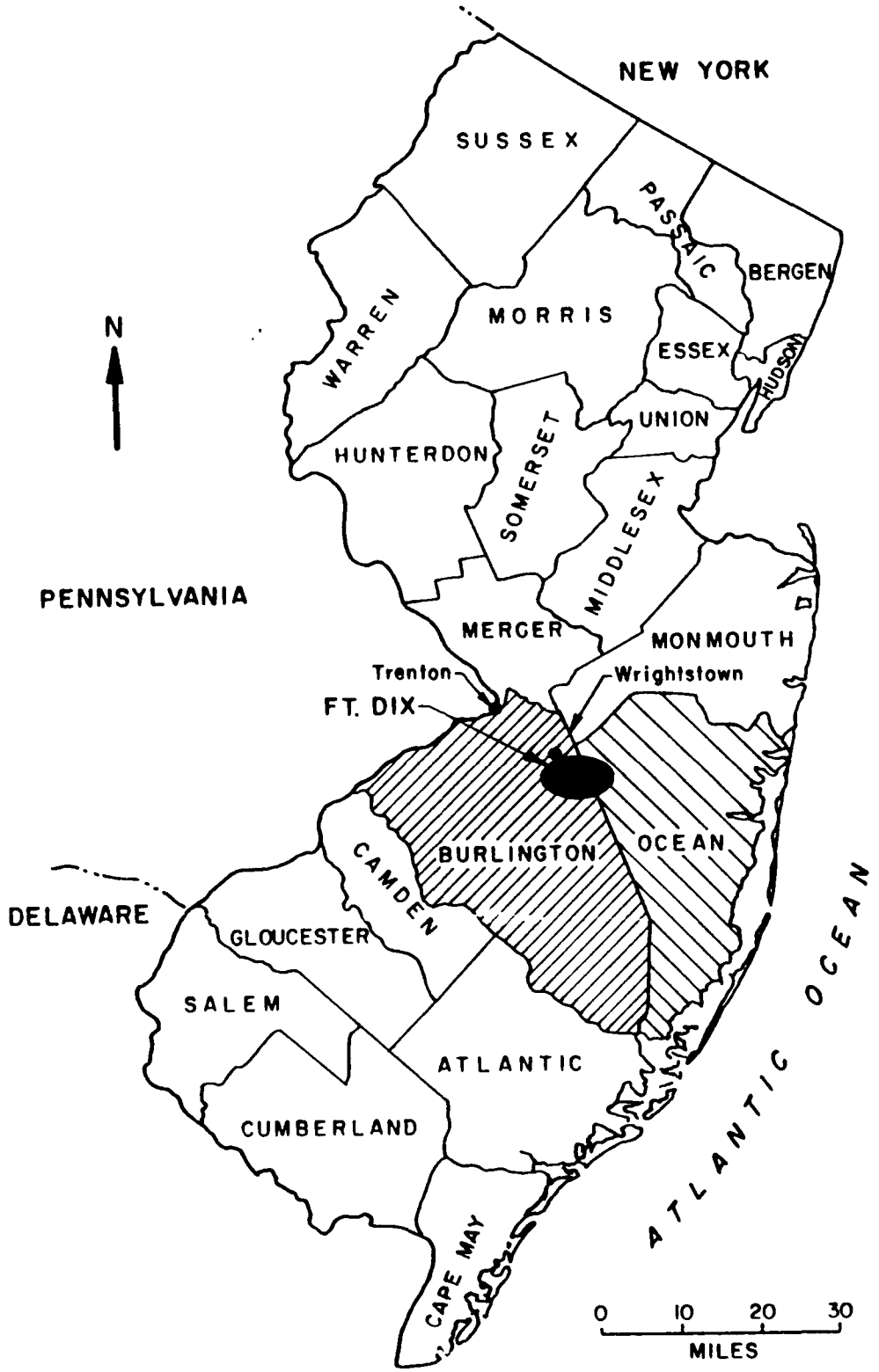

Figure 1. Location of Fort Dix, NJ and county boundaries.

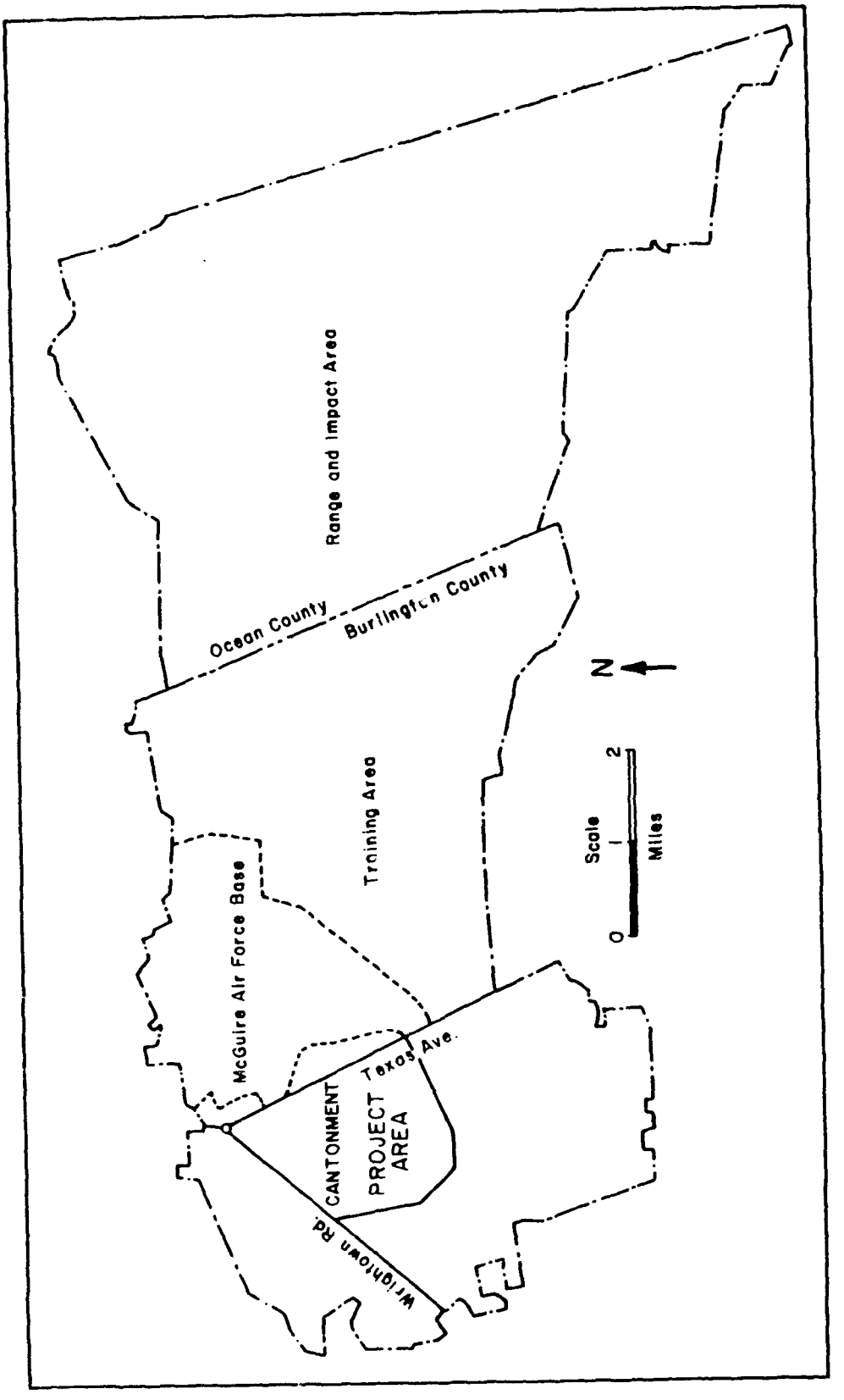

Figure 2. Fort Dix project area and surroundings.

Objectives

The objectives of this study were to record conditions affecting underground storage tanks (USTs) at Fort Dix, to evaluate tank closure processes, and to devise a method to calculate UST closure costs.

Approach

Available literature of Fort Dix was studied to obtain preliminary information on UST locations and characteristics. UST regulations from the U.S. Environmental Protection Agency (USEPA) and the New Jersey Department of Environmental Protection (NJDEP) were reviewed. A literature survey was made in the area of tank closure procedures, tank closure costs, and other pertinent information. Data on 13 of the Fort Dix USTs was taken from the USACERL UST database for analysis. A formula for estimating closure costs was derived by integrating methods and information in current literature with contractors' field experience. This formula was used to estimate closure costs of the 13 Fort Dix USTs.

Mode of Technology Transfer

It is recommended that the results of this study be adapted and incorporated into a technical manual for implantation at other Army installations.

2 HYDROGEOLOGY

Land topography, geologic formations (including soil characteristics), and groundwater conditions of an area are important factors in selecting sites for UST installation or closure. A review of the land formations and drainage features at UST sites should precede any decision to install or close USTs.

For instance, an area with a high water table is not practical for installing a metal UST. USTs should not be located under the water table depth. UST size and depth can combine to create dangerous circumstances. In an area with a 30-ft* water table, a tank with a diameter of 20 ft, buried at a depth of 10 ft, has the potential to affect the local water supply. Soil composition and drainage patterns are also factors that may create a potential for escaped products to seep into underground or surface water supply. Soil with a low pH (is acidic), low resistivity (is corrosive), high permeability (transmits water), or a high water table can accelerate the rate of corrosion on the surface of metallic objects buried beneath the land surface, i.e., metal USTs.

Even though UST closures at Fort Dix were motivated by an installation reorganization, a hydrogeological review of the affected area is still an important part of the closure study, since it will affect the status of remaining USTs at Fort Dix.

Land Surface

The study area is in the Atlantic Coastal Plain; its topography is flat to gently rolling with low relief.[4] Elevations associated with the realignment project area range from about 180 ft above mean sea level (msl) in the west to about 120 ft above msl in the east. The central part of the area is almost uniform with an average elevation of about 135 ft.

The local drainage is toward the southeast, and joins the Delaware River at the western boundary of New Jersey.

Geologic Formations

The principal geologic strata underlying the study area are Cohensey Sand (Pliocene/Miocene age), Kirkwood (Miocene age), and Manasquan Formations (Eocene age), all of the Tertiary (Cenozoic) system (Figure 3).[5] These formations are overlaid by younger and thin (zero to 10 ft) Beacon Hill Formation (Pliocene age), and very thin, younger local deposits of the Quaternary System.

Cohensey Sand is a light gray to yellowish brown, medium- to coarse-grained sand and sandy silt. It is probably less than 50 ft thick at Fort Dix. However, toward the southern part of Burlington County it becomes thicker.

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* A metric conversion table is included on p. 22.

[4] Harry K. Woods, *Investigation of Groundwater Contamination at the Fort Dix Sanitary Landfill, Phase II: Geotechnical* (Geotechnical Laboratory, U.S. Army Waterways Experiment Station [USAWES], January 1985).

[5] Harry K. Woods.

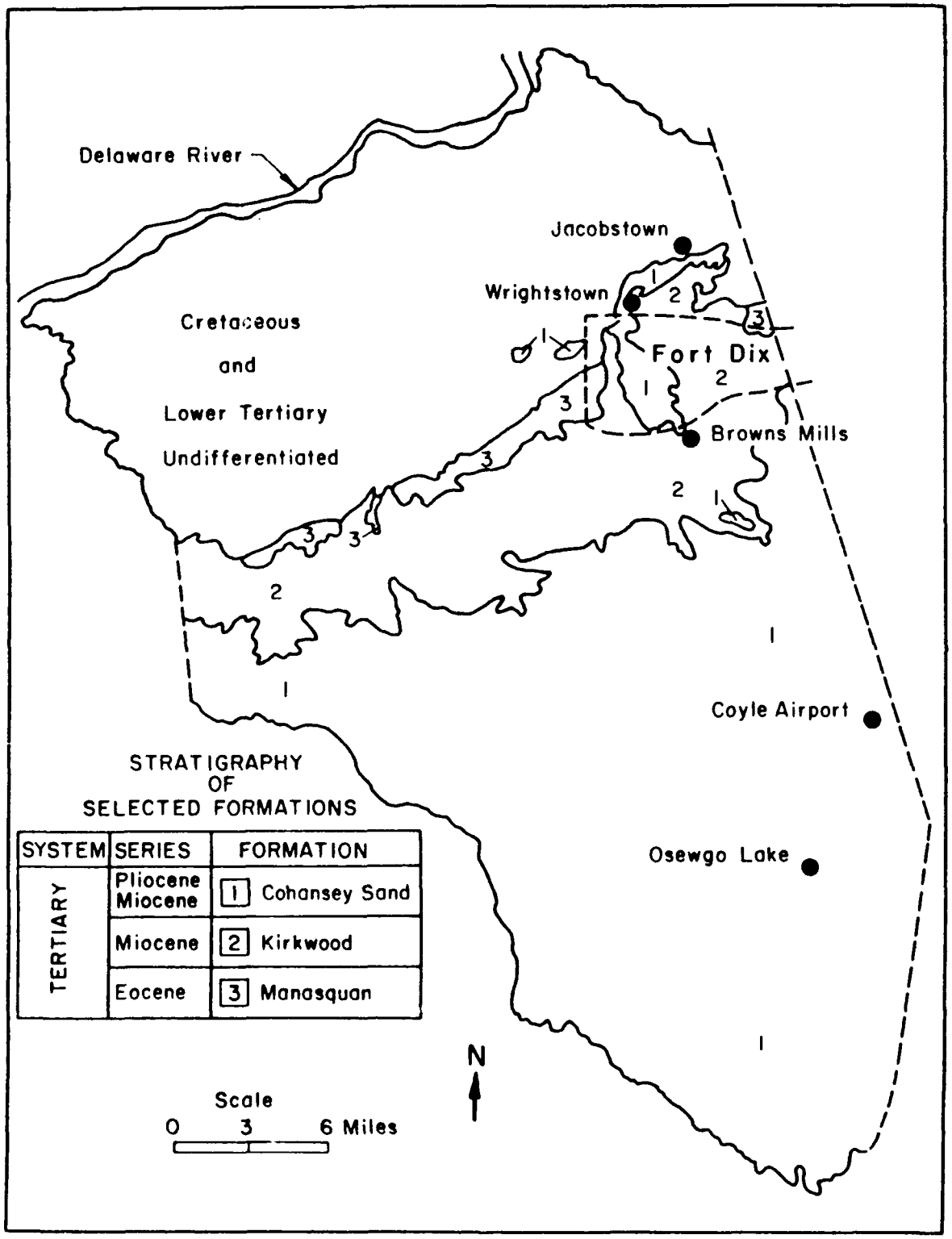

Figure 3. Areal geology of Burlington County, NJ.

Kirkwood Formation underlies the Cohensey Formation. It has a basal unit (brownish-black clayey silt to very fine-grained quartz sand with mica), and a thicker upper unit (very light gray to light yellow orange, very fine- to fine-grained sand). Its thickness increases from about 50 ft in the study area to about 300 ft in the southern parts of Burlington County.

The Manasquan Formation underlies the Kirkwood. This formation is a clayey, quartz-glauconite sand, with a thickness ranging from zero to about 150 ft. Just off the south-central boundary of Fort Dix, this layer becomes thin (about 10 to 15 ft).

Hydrology

In general, a permeable formation (an aquifer, or water-bearing and transmitting body) commonly yields an appreciable amount of water for consumption. An impermeable formation (an aquitard) may contain groundwater, but is not capable of transmitting it. Quaternary deposits are too thin or absent to be tapped for water, and have a hydraulic connection with underlying Tertiary formations.

In Fort Dix and its surrounding area, precipitation is the principal source of fresh water (45 in./year), and large quantities of groundwater are available.[6] The Cohensey Formation at the top has variable ability to store and yield water. The Kirkwood Formation yields poor to excellent water in places. These formations are the source of only small quantities of groundwater for local domestic or agricultural needs. The Manasquan Formation, being an aquitard, functions mainly as a confining bed, separating the aquifers occurring above and below the formation.

Seasonal water-table fluctuation is usually less than 10 ft. Depths to the water table in Tertiary formations range from about 5 to 85 ft., depending on locality. (High water tables are commonly associated with depressed areas of terrain, and surface water bodies.)

In the Fort Dix area, groundwater flows in a generally southeasterly direction. The northwest region of the Fort uses large amounts of groundwater for industrial purposes. These users tap the formations of the Cretaceous System (Mt. Laurel, Englishtown and Magothy/Raritan) that underlie the Tertiary formations at depths several hundred feet from the land surface.

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[6] Harry K. Woods.

3 NEW JERSEY UST REGULATIONS

Preliminary Work

On 3 September 1986, the New Jersey Underground Storage of Hazardous Substances Act was signed into law. This Act is authorized to adopt a regulatory program for the prevention and control of unauthorized discharges of hazardous substances from UST systems. The New Jersey Act is primarily based on the Federal HSWA of 1984.

On 21 December 1987, the New Jersey Department of Environmental Protection (NJDEP) adopted an Administration Code that covers UST Registration Requirements and Fee Rules.[7]

Proposed Rules

On 7 August 1989, the NJDEP proposed to amend subchapters 1, 2, and 3, covering General Information, Registration Requirements and Procedures, and Fees.[8] The NJDEP repealed subchapter 4 and proposed updated penalty provisions in subchapter 12. The new rules in subchapters 4 through 11, and subchapter 15 set out the Department's performance and design standards for new and existing USTs. The new rules establish minimum construction standards for all new USTs, requirements to upgrade existing USTs, and technical requirements for installing, removing, and closing UST systems. The new rules also establish requirements for the permitting of any replacement, installation, expansion, or substantial modification of a facility, and corrective action for treating soil and groundwater contaminated by hazardous substances released from UST systems. The proposed rules are similar to the Federal UST regulations of 1988, and were finalized in September 1990. Until then, the Federal rules applied for UST management in the State of New Jersey. There are no substantial differences between the proposed and finalized rules (New Jersey State Act 58:10A, and 7:14B-1-13 and 15).[9]

To comply with these rules, tank owners are required to complete a "standard reporting form" and return it to the NJDEP within 30 days after installing a new tank. Not later then 90 days after completing a UST closure, the owner must submit a "site assessment compliance statement" to the NJDEP (Appendix A).

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[7] Other relevant published industry codes and standards for USTs are listed in the reference section of this report (p. 23).

[8] *Underground Storage Tank Systems Technical Requirements and Procedures: Proposed Amendments, Proposed Repeal, and Proposed New Rules* (Bureau of Underground Storage Tanks, Department of Environmental Protection, New Jersey Register, August 1989).

[9] *Regulations Implementing the New Jersey Underground Storage of Hazardous Substances Act* (NJDEP, September 1990).

4 USTs AT FORT DIX

Overview

USACERL's updated UST database indicates that there are 99 USTs at Fort Dix. About half these tanks are over 25 years old, and only a few are less then 10 years old. Most of the tanks are made of carbon steel (84 percent), and others are constructed from fiberglass-reinforced plastic (FRP). Approximately 80 percent of the USTs are externally painted, and some have internal linings. Most of the USTs have capacity ranges of 1100 to 10,000 gal (74 percent) and a few have capacities of 10,000 to 20,000 gal (11 percent). Approximately half of these tanks hold motor fuel and another 43 percent contain heating oil. A majority of these tanks fall in the medium LPI category.

UST Situation in Affected Area

Most real properties of the project area (the Doughboy Loop) in the southern half of the cantonment area will permanently cease activity in the near future (Figure 2). The affected area contains 23 USTs, located in blocks 5200, 5700, 5800, 5900, 6500, 6600, and 6700. Table 1 gives these tanks' locations, identifications (ID) and other pertinent information.

The information in Table 1 was provided by the Fort Dix office in early spring 1990. Tank IDs prefixed with "A" indicate tanks not presently in use. The other 19 tanks are in use. Tank IDs prefixed with "A" and "E" are small, with capacities ranging from 275 to 1000 gal, and contain principally No. 2 fuel oil. Tanks IDs without numbers indicate USTs not included in the USACERL database.

Certain information on Fort Dix USTs was not recorded in the USACERL database. Records for leak detection by monthly monitoring and annual tightness testing began at the end of 1989. There was no record of leak detection for pressurized or suction piping. Records were not available to show the existence of spill/overfill-prevention devices, or to show the processes used to ensure tank and piping compliance with NJDEP regulations.

USACERL's UST Data for Affected Area

The USACERL UST database provides information on only the 13 tanks with IDs including a letter and numbers, e.g., A71 or E38. Table 2 lists information on these 13 tanks.

The USACERL database shows that three of the 13 tanks are not in use. Tank A71 has not been used since 1975, but still contains about 305 gal of gasoline. The other two inactive tanks, A57 and A72, have been empty since 1981 and 1975, respectively. According to the database, these 13 USTs, including their piping, are made of steel materials with single-wall construction. Eight tanks are less than 30 years old. Three tanks are 31, and two are 50 years old. All are painted externally and some are lined internally, giving them some limited protection against corrosion. Nine of the tanks contain motor fuel (diesel and gasoline) and fuel oil (No. 2 and No. 6). The majority of the tanks (eight) have a 5000-gal capacity. Three tanks have 25,000-gal capacities. All of these tanks have LPI ratings ranging from 2.5 to 3.2, the medium potential for possible leakage. More detailed information on these 13 tanks is given in Appendix B.

Table 1

UST Data for Affected Area of Fort Dix Realignment Project

Location	Tank ID	Status		Capacity (gal)	
		In Use	Not in Use	≤1000	>1000
5252-1	E38	X			X
5252-2	E39	X			X
5252-3	E40	X			X
5706	E56	X			X
5720	A57		X		X
5880	E58	X			X
5881	E59	X			X
5882	E60	X			X
5901	E61	X			X
5926	E62	X			X
5927	E63	X			X
6510	E--	X		X	
6518	E--	X		X	
6523	E--	X		X	
6608	E--	X		X	
6621	A--		X	X	
6622-1	E--	X		X	
6737	E--	X		X	
6738	E--	X		X	
6739	A71		X		X
6739	A72		X		X
6741	E--	X		X	
6749	E--	X		X	

Table 2

USACERL Data on Affected USTs

ID	Age	Material	Capacity (gal)	Content	Corrosion Protection	LPI (yr)
A57	25	Steel	5000	Gasoline	External paint	Medium
A71	50	Steel	5000	Gasoline	External paint	Medium
A72	50	Steel	5000	Gasoline	External paint	Medium
E38	31	Steel	25000	#6 Fuel oil	External paint	Medium
E39	31	Steel	25000	#6 Fuel oil	External paint	Medium
E40	31	Steel	25000	#6 Fuel oil	External paint	Medium
E56	25	Steel	2000	Diesel fuel	External paint	Medium
E58	25	Steel	5000	Unleaded gas	External paint	Medium
E59	26	Steel	5000	Diesel fuel	External paint	Medium
E60	26	Steel	5000	Gasoline	External paint	Medium
E61	19	Steel	6000	#2 Fuel oil	External paint	Medium
E62	22	Steel	5000	Unleaded gas	External paint	Medium
E63	22	Steel	5000	Diesel fuel	External paint	Medium

5 UST CLOSURE PROCEDURES

Overview

When a UST and its site is closed, either temporarily or permanently, the tank may either be kept in place or removed, depending on the situation. A tank may be kept in place if it is to be reactivated in the near future. In a permanent closing, tank removal is the safest alternative. The American Petroleum Institute (API) report No. 1604 provides detailed information governing UST closure practices.[10] Any tank not used for 3 to 12 months should be temporarily closed.[11] The regulatory authorities must be consulted to gain permission to extend this time limit. The stored substance should be removed and the tank should be cleaned. For tanks containing an explosive atmosphere, oxygen should be replaced with an inert CO_2 atmosphere by inserting dry ice in the tank. When a tank is reactivated, the liquid tank contents will replace the CO_2 gas.[12] If more than 1 in. of residue or more than 0.3 percent by weight of the total capacity of the system remain in the tank during temporary closure, a release detection device and a corrosion protection system (if they exist) must continue to operate. However, if the UST system is completely empty, there is no need to maintain a leak detection device. If a UST is not protected from corrosion and remains closed for more than 12 months, or if it is decided to close the tank permanently, closure processes are different.[13] Table 3 shows tank closure procedures with alternatives. These procedures are applicable for most closure situations in every state, including New Jersey, and meet recent Federal UST regulations.

Maintenance inspections of temporarily closed tanks mainly consist of checking the corrosion protection system. The process is simple, and the cost is slight, unless there is a need for a repair or for a replacement in the temporarily closed tank system. This maintenance enables a tank owner to keep the existing equipment, including the tank, in good condition for the service life of the tank, whether in use or soon to be reactivated.

Reactivation of a Tank and Compliance Cost

To reactivate a temporarily closed tank, the FRP tank must be compatible with the new substance it will contain. The inside of the tank must be cleaned. The tank and the piping must have an integrity (tightness) test, even if the system has corrosion protection. After the initial refilling, a regular inventory program should be initiated. Facilities to monitor vapor, groundwater, interstitial and tank gauging must be put into operation immediately after the tank is activated.

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[10] *Removal and Disposal of Used Underground Petroleum Storage Tanks, API Recommended Practice 1604*, 2d ed. (American Petroleum Institute [API], December 1987).

[11] *Musts for USTs: A Summary of the New Regulations for Underground Storage Tank Systems* (U.S. Environmental Protection Agency [USEPA], Office of Underground Storage Tanks, September 1988).

[12] Albert D. Young, Jr., et al., *Underground Storage Tank Management: A Practical Guide*, Hart Environmental Management Corp. (Government Institute, June 1987).

[13] *Musts for USTs*.

Table 3

UST Closure Procedures

Temporary Closure (Keep UST in Place)	Permanent Closure (Keep UST in Place)	Permanent Closure (Remove UST)
Notify regulatory authority	Notify regulatory authority	Notify regulatory authority
Contracting/scheduling	Contracting/scheduling	Contracting/scheduling
	Excavate to top of tank	Excavate to top of tank
Remove product from UST	Remove product from UST	Remove product from UST
Clean inside of tank	Clean inside of tank	Clean inside of tank
Cap all fill lines	Remove all fill lines	Remove all fill lines
	Disconnect plumbing	Disconnect plumbing
Cap gauge lines	Remove gauge lines	Remove gauge lines
Cap pump Lines	Remove other fixtures	Remove other fixtures
Keep vent line open	Keep vent line open	Not applicable
Check for release*	Check for release	Check for release
Cut off power	Cut off power	Cut off power
	Plug all openings	Not applicable
		Excavate around UST
		Purge with CO_2
		Remove the tank
		Dispose of tank or scrap the (cut) metal
If No Leak Exists:		
Place locks on openings	Fill w/inert metal	Backfill tank
	Restore surface to original condition	Excavate area
		Restore surface to original condition
Periodic inspection[14]	Inspection program	
Registration/reporting	Registration/reporting	Registration/reporting

If Leak Exists (All Cases):

Report to regulatory authority
Take health and safety precautions
Test tank tightness (temporary closing only)
Assess risk and potential liabilities
Determine extent of contamination
Preliminary investigation, hydrogeologic study
Recover product if possible
Remove and dispose contaminated soil
Clean groundwater, monitor soil and groundwater
Document events to regulatory authority

* In a tank closure, inventory should be reviewed. If size allows, an inside inspection should be done. Soil in the tank area must be checked for hydrocarbon vapor by a leak-detecting device. Freon or similar tracers can be released into the tank to check for leakage. A dipstick with hydrocarbon detection paste should also be used to check the monitoring wells for releases into the water or soil. (These are economical methods to find out if there has been a release.)

[14] Environmental inspection (for release of residual product) of tanks kept in place after a permanent closing is usually done through the monitoring well system. Records are kept up to 3 years.

The NJDEP estimates that the cost for compliance with the Department's proposed new rules for retrofitting existing tanks will vary, depending on the tank and the surroundings.[15] These cost estimates range from $2000 to $10,000 for monitoring systems, $5000 to $7500 for corrosion protection systems, and $1500 to $5000 for spill and overfill prevention devices. If a tank already has these items in the system, cost to reactivate is fairly small. After reactivation, annual tank maintenance cost is negligible.

Generic Tank Closure Cost

Since several factors affect costs within each closure category, the UST closure costs listed in Tables 4 and 5 reflect the lower and upper levels of the costs. Most tank closure costs will fall between these extremes. These figures are based on a generic tank with a 10,000-gal capacity,[16] and on a rule-of-thumb cost decrement of 15 percent for smaller tanks, i.e., tanks with less than a 10,000-gal capacity will cost 15 percent less to close than larger tanks. The cost to close each additional tank at a single site is calculated as one-third the first-tank cost. Field work in tank closure under normal conditions (where there is no major release to the environment) may be completed as quickly as within a few hours, or in as many as 5 days, depending on tank size and other circumstances.

Cost of Tank Closure at Fort Dix

The NJDEP estimates that tank decommissioning costs will range from $4000 to $9000 per tank, while costs for tank site assessment will range from $2000 to $10,000.[17] Since these figures are compatible with cost ranges listed in Table 4, the tank closure costs of Fort Dix are based on the cost figures of Table 4. These costs do not include an environmental cleanup cost, which may range from $50,000 to $1,000,000 per tank site.

Tank size and the number of tanks at a site are important factors in closure. Tanks with greater sizes cost more to close. Also, each additional tank at a site is less costly to close than the first. Tanks A71 and A72 are located in building 6739, and tanks E38, E39, E40 are in building 5252 (two separate sites). Each of the other 8 tanks is located in its own site, making a total of 10 tank sites to evaluate.

To Keep USTs in Place

The cost to close and keep a 10,000-gal tank in place ranges from $10,000 to $20,000 (Table 4). However, a small tank (with a capacity below 10,000 gal) should cost somewhat less. Assuming that a small tank will cost 15 percent ($1500 to $3000) less than a larger tank,[18] a tank with a capacity less than 10,000 gal, buried in a site singly, should cost about $8500 to $17,000 ($10,000-[$10,000 × 0.15] to $20,000-[$20,000 × 0.15]). Tanks A57, E56, E58, E59, E60, E61, E62, and E63 all have capacities

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[15] *Underground Storage Tank Systems Technical Requirements and Procedures.*

[16] *Tank Management and Corrective Action Costs, Estimating the Expenses of Environmental Management* (Hart Environmental Management Corporation, March 1989).

[17] *Underground Storage Tank Systems Technical Requirements and Procedures.*

[18] Personal communication: Deven B. Schmitt, UST Program Manager, Hart Environmental Management Corporation, New York, NY (March 1991).

Table 4

UST Closure Costs

Closure Alternatives	Cost Range	Included Activities
Temporary closure	$3000-$6000	Tank emptying, cleaning, capping fill lines and periodic inspection
Permanent tank retention	$10,000-$20,000	Construction management ($2000-$5000), removal of product, excavation to the tank top, removal of capping and isolation of associated equipment, tank cleaning, filling with inert material, restoration of tank area
Tank removal	$10,000-$20,000	Construction management ($2000-$5000), removal of product, disconnecting and removing associated tank lines, tank cleaning, rinsing, tank excavation and removal, tank transport and disposal, backfilling and restoration of tank area
Small tank closure	$4000-$8000	Closing small capacity (1000 or fewer gal) UST, removing or keeping a tank in place (requires several hours)

Table 5

Cost Rate Related to UST Management

Closure Alternatives	Cost Range	Included Activities
Hydrogeologic site study	$1000-$2000	Hydrogeologist ($50-$100/h; higher rates are expected for a more experienced or certified professional)
Preliminary leak investigation	$4000-$10,000	Backhoe and operator ($150-$200/h), excavation equipment and operators ($2000-$2500/d), drilling equipment ($1000-$1500/d), management ($50-$100/h)
Testing tank integrity	$2000-$3000	Engineering oversight ($40-$70/h), test contractors ($900-$1500 total: $300-$800/ test; $75-$150/line-test or leak detector test)

less than 10,000 gal (2000 to 6000 gal), and are buried in individual sites. The total closing cost for these eight tanks will then be $68,000 to $136,000 (8 × $8500 to 8 × $17,000).

If a site contains more than one tank, and each tank capacity is less than 10,000 gal, the closure cost can be calculated on the basis of a single tank cost ($8500 to $17,000). Then, one third of a single tank cost, $2833 to $5667 ($8500/3 to $17,000/3), is added to the first tank cost to calculate the cost of the second tank. This method of calculation is commonly used by contractors as a rule of thumb to determine UST closure costs.[19] By this formula, closure of tanks A71 and A72 will cost between $11,333 and $22,667 ($8500 + $2833 and $17,000 + $5667).

If tank capacity is over 10,000 gal, a 15 percent increment cost is added to the base minimum and maximum tank closure costs ($10,000 and $20,000) listed in Table 4. Add-on costs are $1500 (10,000 × 0.15) and $3000 (20,000 × 0.15). Closing costs for a singly buried large tank fall between $11,500 and $23,000 ($10,000 + $1500 and $20,000 + $3000).

Building 5252 contains three tanks (E38, E39 and E40) with capacities over 10,000 gal (25,000 gal each). The closure cost for the first tank (E38) will fall between $11,500 and $23,000. One-third of the costs in the range, $3833 and $7667 ($11,500/3 and $23,000/3), should be added twice to cover the costs of the second and the third tanks. The total closure cost of this site (three tanks) will range from $19,166 ($11,500 + $3833 + $3,833) to $38,334 ($23,000 + $7667 + $7667).

The average closing cost for each singly buried tank (A57, E56, E58, E59, E60, E61, E62, and E63) is $12,750 ([$8500 + $17,000]/2). Then this group's (eight tanks) total average tank closure cost is $102,000 (8 × $12,750).

The site with tanks A71 and A72 will average $17,000 ([$11,333 + $22,667]/2) in closing cost.

The site containing the three large tanks (E38, E39, E40) averages $28,750 ([$19,166 + $38,334]/2) in closing cost.

The grand total of average closing costs for all 13 tanks is $147,750 ($102,000 + $17,000 + $28,750).

It should be noted that calculated closure costs are modest figures and do not include cleanup costs of soil or groundwater. In the case of a leak, additional funds ($50,000 to over $1,000,000 per tank site) may be needed for the cleanup.

To Remove USTs

The same principles of using a 15 percent cost reduction or increment (for size adjustment), and a cost increase of one-third for each tank at a site after the first, can also be applied to costs of removing tanks. Thus, the costs of removing tanks during closure are the same as for retaining them.

In this case, total minimum and maximum removal costs for the singly buried tanks (A57, E56, E58, E59, E60, E61, E62 and E63) will be $68,000 and $136,000, the same as for closing tanks in

[19] Personal communication: Robert J. Robbins, C.P.G., Project Manager, Underground Tank Management Services, RMT, Inc., Madison, Wisconsin (April 1990).

place. Closing cost figures for the site with tanks A71 and A72 range from $11,333 to $22,667. Closing costs for the site with tanks E38, E39 and E40 will range from $19,166 to $38,334. The average cost to remove 13 tanks is $147,750 ($102,000 + $17,000 + $28750).

Costs of New Tank and Installation

The cost of replacing an old tank with a new one, or of installing a new tank depends on the type and capacity of the tank, and the installation procedures. The cost figures listed in Table 6 were based on a tank with a 10,000-gal capacity.[20]

Table 6

New Tank and Installation Costs

Item	Includes	Cost Range
Tank cost	• Single-walled steel tank, asphalt and epoxy-coated, with sacrificial anodes	$3000-$4500
	• Single-walled steel tank, fiberglass-coated	$6000
	• Single-walled FRP tank (Price of a double-walled tank is almost 90 to 100 percent more than the single-walled tank cost)	$5500
Installation	• Handling, excavation, testing for leaks, anchoring when necessary, bedding and backfilling, piping connections and monitoring, cathodic protection system (This figure increases by adding choice of ancillary equipment.)	$5000-$8000
Monitoring equipment	• Sensor system, between-wall tank/pipe	$300-$1600
	• Electronic inventory control for multiple tanks	$4000-$7000
	• Contractor-supplied tank test	$300-$1200
	• Drilling cost for each monitoring well	$300-$600
	• Electronic gas sensor for well	$300-$1500
	• Electronic petroleum sensor for well	$300-$700

[20] Young; Rich Cross, "Equipment Selection: Tank Owner's Survival Guide," *Commercial Carrier Journal* (March 1987).

6 CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study has documented the conditions affecting USTs at Fort Dix, NJ. Both climate and soil conditions affect the installation, use, and closure of USTs. Pertinent Federal and State regulations governing USTs were also summarized, and tank closure procedures under various circumstances were outlined.

This study developed a method for estimating costs of closure of USTs at Fort Dix. This method estimates costs of UST closure, whether USTs are removed or retained in place, and whether USTs have been buried singly on separate sites, or in groups on a single site. The calculation is based on a tank size of 10,000 gal, but also includes adjustments for larger or smaller tanks. For smaller tanks, the cost is reduced by 15 percent; for larger tanks, the cost is increased by 15 percent. For each additional tank on a given site scheduled for closure, the estimated cost is increased by one-third.

The Fort Dix Realignment Project will affect areas containing 23 USTs, aged between 18 and 49 years. At least 13 of these USTs are scheduled for closure. The tanks store mainly motor fuel or fuel oil, and have capacities from 2000 to 25,000 gal. The tanks all have single-wall steel construction and exterior paint against corrosion. All tanks have medium LPI values.

A USACERL UST database has detailed information on 13 of the tanks at Fort Dix scheduled for closure. Eight of these tanks are small (capacity less than 10,000 gal) and were buried singly. Two of the tanks are small and located together on a single site. The remaining three tanks are large (capacity more than 10,000 gal) and are located on a single site. The average closure cost of the 13 tanks was estimated to be $147,750.

These calculated costs do not include cleanup costs resulting from possible soil or groundwater contamination. In the case of a leak, additional costs (from $50,000 to over $1,000,000 per tank site) may be incurred.

Recommendations

It is recommended that closing costs be estimated for the 10 remaining USTs in the Fort Dix Realignment Project. The cost study for these tanks should be based on the methods used in this report.

It is also recommended that any installation anticipating UST closure follow these procedures and precautions:

1. Before beginning any tank closure, current Federal and state UST regulations should be carefully studied and followed.

2. Before beginning any tank closure, the environment of the tank site should be studied.

3. The total number and sizes of tanks at each site should be carefully checked, since these factors dramatically affect the overall closure cost.

4. If the project is to be contracted out, tank closing cost margins stated in this report should be used as a guidelines.

5. Allowance should be made for the additional funds to cover changed conditions, especially leaks. It is important to note that cleanup resulting from possible soil or groundwater contamination could incur additional costs (from $50,000 to over $1,000,000 per tank site).

6. All preventive measures must be taken into consideration to avoid any personal injuries and environmental hazards during closing processes. This action will not only provide legal protection, but will also avoid the large and unnecessary costs that can result from cleanup of accidental spills.

METRIC CONVERSION TABLE

1 gal	=	3.78 l
1 ft	=	0.305 m
1 mi	=	1.61 km
1 acre	=	0.405 hectare

CITED REFERENCES

Cross, Rich, "Equipment Selection, Tank Owner's Survival Guide, Part Two," *Commercial Carrier Journal* (March 1987).

Donahue, B.A., T.J. Hoctor, and K. Piskin, *Managing Underground Storage Tanks Using dBASE III PLUS*, Technical Report (TR) N-87/21/ADA182452 (U.S. Army Construction Engineering Research Laboratory [USACERL], June 1987).

Guide to Military Installations in the United States: Supplement to the Army times, Navy Times, Air Force Times (*Times Journal*, April 1990).

Must For USTs, A Summary of the New Regulations for Underground Storage Tank Systems (U.S. Environmental Protection Agency [USEPA], Office of Underground Storage Tanks, September 1988).

Regulations Implementing the New Jersey Underground Storage of Hazardous Substances Act (Division of Water Resources, New Jersey Department of Environmental Protection [NJDEP], September 1990).

Removal and Disposal of Used Underground Petroleum Storage Tanks, API Recommended Practice 1604, 2d ed., (American Petroleum Institute [API], December 1987).

Tank Management and Corrective Action Costs, Estimating the Expenses of Environmental Management (Hart Environmental Management Corporation, March 1989).

TRADOC Installation Guide, TRADOC Pamphlet No. 210-1, (Army Training and Doctrine Command, 1981).

Underground Storage Tank Systems Technical Requirements and Procedures: Proposed Amendments, Proposed Repeal and Proposed New Rules (Bureau of Underground Storage Tanks, Department of Environmental Protection, New Jersey Register, August 1989).

Code of the Federal Register, Part II, 40 CFR Parts 280-281: pp. 37081-37247, *Underground Storage Tanks: Technical Requirements and State Program Approval* (September 1988).

Woods, Harry K., *Investigation of Groundwater Contamination at the Fort Dix Sanitary Landfill, Phase II: Geotechnical*, Draft Report (Geotechnical Laboratory, U.S. Army Waterways Experiment Station [USAWES], January 1985).

Young, A.D., et al., *Underground Storage Tank Management: A Practical Guide* (Government Institute, June 1987).

UNCITED REFERENCES

Automotive and Marine Service Station Code, NFPA 30A (National Fire Protection Association, 1987).

Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems, Recommended Practice, 2d ed., API Publication 1632 (API, 1987).

Flammable and Combustible Liquids Code, NFPA 30 (National Fire Protection Association, 1987).

Installation of Underground Petroleum Storage Systems, Recommended Practice, 4th ed., API Publication 1615 (API, 1987).

Interior Lining of Underground Storage Tanks, Recommended Practice, 2d ed., API Publication 1631 (API, 1987).

Recommended Practices for Installation of Underground Liquid Storage Systems, PEI RP-100-87 (Petroleum Equipment Institute, 1987).

Recommended Practice: Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Liquid Storage Systems, NACE RP-285 (National Association of Corrosion Engineers, 1985).

Standard for Tank Vehicles for Flammable and Combustible Liquids, NFPA 385 (National Fire Protection Association, 1985).

APPENDIX A: New Jersey UST Registration Forms

For State Use Only	
Date Rec'd.	
Auth	
Routing	
UST NO.	

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
CN 028
TRENTON, NEW JERSEY 08625
ATTN: BUST Program
(609) 984-3156

STANDARD REPORTING FORM
for the:

Installation/Abandon/Remove/Sale-Transfer/Substantial Modification

Circle Only One — Use One Form Per Activity

(More than one tank can be listed per tank activity)

Answer questions 1 through 5 and others as applicable.

1. Company name and address: (as it appears on registration questionnaire) _____

2. Facility name and location: (if different from above) _____

3. Contact person for this activity: _____

   Telephone Number: ( ) _____

4. The identification number of the affected tank as it appears in Question Number 12 on the Registration Questionnaire:

   _____

5. Registration Number (if known): UST - _____

6. For TRANSFER OF OWNERSHIP:

New Company Name _____

New Facility Name _____

Address _____

_____

New owner/operator (print) _____

Signature _____

7. For ABANDONMENT or REMOVAL:

a. Describe the proposed procedure in detail on an attached sheet.

b. Specify the product last stored in the tank: _____

c. Date abandoned or removed _____

d. Is Site Assessment Compliance Statement being completed? YES or NO Form MUST be completed and returned within 90 days of tank closure. (per 40 CFR 280.72)

8. For SUBSTANTIAL MODIFICATIONS:

a. Describe the reason for the modification and, in detail, the proposed procedure to be used on an attached sheet.

b. Specify the product presently stored in the tank. _____

c. Specify the product to be stored in the tank: _____

9. For NEW OR REPLACEMENT INSTALLATIONS:

a. Attach the specifications as required by the attached instructions.

b. Specify the product (s) to be stored in the tank: _____

NOTE: All appropriate and applicable permits, licenses and certificates from any local, state and/or federal agency must be obtained separately from this notification as required by the above stated activity.

CERTIFICATION

**** This registration form shall be signed by the highest ranking individual at the facility with overall responsibility for that facility. (7:14B-2.3 (a) 1). ****

"I certify under penalty of law that the information provided in this document is true, accurate and complete. I am aware that there are significant civil and criminal penalties for submitting false, inaccurate or incomplete information, including fines and/or imprisonment."

Signature: _____

Name (print or type): _____

Title: _____ Date: _____

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Underground Storage Tanks
CN-029, Trenton, NJ 08625

SITE ASSESSMENT COMPLIANCE STATEMENT

For State Use Only
Date Rec'd _____
Auth _____
Routing _____
UST NO. _____

Supplement to the New Jersey Standard Reporting Form
(Complete for ALL regulated UST abandonments or removals)

Within ninety (90) days of completing the UST closure of any State or Federally-regulated tank, the owner or operator must submit this completed form to the NJDEP Bureau of Underground Storage Tanks. If the facility is located in one of the counties listed on the back, a copy of this form must also be sent to the Health Agency indicated.

The owner or operator of any Federally-regulated tank must also comply with the following:

40 CFR Part 280.72 Assessing the site at closure or change-in-service

"(a) Before permanent closure or a change-in-service is completed, owners and operators must measure for the presence of a release where contamination is most likely to be present at the UST site. In selecting sample types, sample locations, and measurement methods, owners and operators must consider the method of closure, the nature of the stored substance, the type of backfill, the depth to ground water, and other factors appropriate for identifying the presence of a release."

FACILITY_____ UST #_____

Check off the following items as appropriate for the site.

_____ The UST facility is only regulated by State law, therefore a site assessment is not mandatory.

_____ The UST facility is regulated by Federal law and a site assessment was conducted.

The results of the site assessment indicate:

_____ There was NO release from the UST system.

_____ There was a release from the UST system and it was reported to the DEP Environmental Hotline (609-292-7172).

NOTE: The results of the site assessment are not to be submitted to the DEP or Health Agency unless requested to do so. The results are to be available for inspection at the UST facility.

Questions can be directed to the Bureau at (609) 984-3156.

*** This registration form shall be signed by the highest ranking individual at the facility with overall responsibility for that facility (7:14B-2.3 (a) 1). ***

"I certify under penalty of law that the information provided in this document is true, accurate and complete. I am aware that there are significant civil and criminal penalties for submitting false, inaccurate or incomplete information, including fines and/or imprisonment.

_____ Date / /
(SIGNATURE)

_____
(PRINT OR TYPE NAME)

HEALTH AGENCIES TO BE NOTIFIED OF UST CLOSURES

Burlington County
Walter Trommelen, M.D.
Raphael Meadow Health Center
Woodlane Rd.
Mt. Holly, NJ 08060
(609) 265-5548

Cape May County
Louis LaManna
Public Health Coordinator
Department of Health
Cape May Courthouse, NJ 08210
(609) 465-1209

Cumberland County
Manuel Ostroff
Public Health Coordinator
Cumberland Co. Health Dept.
790 E. Commerce St.
Bridgeton, NJ 08302
(609) 451-8000 Ext. 1271

Gloucester County
H. Fred Schuster, Jr.
Department of Health
Carpenter St. & Aliens Lane
Woodbury, NJ 08096
(609) 845-1600

Hudson County
Robert Ferraiuolo, Director
Hudson Reg. Health Commission
215 Harrison Ave.
Harrison, NJ 07029
(201) 485-7001

Hunterdon County
John Beckley, Director
Hunterdon Co. Health Dept.
Administration Bldg.
Flemington, NJ 08822
(201) 788-1351

Middlesex County
Laszlo Szabo, Health Officer
Middlesex Co. Health Dept.
417 Dennison St.
Highland Park, NJ 08904
(201) 828-8100

Monmouth County
Lester W. Jargowsky
Monmouth Co. Health Dept.
P.O. Box 1255
Freehold, NJ 07728
(201) 431-7456

Passaic County
Richard Lester
City of Paterson
Division of Health
176 Broadway
Paterson, NJ 07505
(201) 881-3914

Salem County
Laurence Devlin, Jr.
Salem Co. Health Dept.
98 Market St.
Salem, NJ 08079
(609) 935-7510

HEALTH2-2/89

APPENDIX B: Detailed Information for Thirteen Fort Dix USTs

I. OWNERSHIP OF TANK(S)
(Please update for each location.)

Owner/Installation Name		Sub-Installation Name	
TRADOC FT DIX		X	
State	**Zip Code**	**State**	**Zip Code**
NJ	08640-5501	X	00000-0000

II. LOCATION OF TANK(S)

Facility Name or Company Site Identifier
FT DIX

Street Address
X

County
BURLINGTON

City	State	Zip Code
FT DIX	NJ	08640-5501

The number of tank(s) at this location is: 99

Please update the following 80 pages of tank information.

Please indicate the number of tanks added to the current list: ____

III. CONTACT PERSON

Name and Official Title	Signature	Phone Number	Date Signed

IV. DESCRIPTION OF UNDERGROUND STORAGE TANKS
(Complete for each tank at this location.)

Tank Identification No. (Assigned Sequential Number) (e.g. 1,2,3 . . .)	Tank # No. A57	Tank # No. A71	Tank # No. A72	Tank # No. E38	Tank # No. E39
1. Status of Tank (Mark One) Currently in Use				_X_	_X_
Temporarily Out of Use					
Permanently Out of Use	_X_	_X_	_X_		
Replaced					
Extracted					
2. Additional Information (for tanks taken out of service)					
a. Estimated date last used (mo/yr)	00/81	00/75	00/75		
b. Estimated quantity of substance remaining (gal)	0	305	0		
c. Mark if tank closed in accordance with EPA guidelines					
3. Estimated Installation Date (Yr)	1966	1941	1941	1960	1960
4. Estimated Total Capacity (Gal.)	5000	5000	5000	25000	25000
5. Tank Material of Construction (Mark One) Steel	_X_	_X_	_X_	_X_	_X_
Concrete					
Fiberglass Reinforced Plastic					
Unknown					
Other, Please Specify					
6. Piping Material of Construction (Mark One) Bare Steel	_X_	_X_	_X_	_X_	_X_
Galvanized Steel					
Fiberglass Reinforced Plastic					
Unknown					
Other, Please Specify					
7. Tank Construction (Mark One) Single Wall	_X_	_X_	_X_	_X_	_X_
Double Wall					
8. Pipe Construction (Mark One) Single Wall	_X_	_X_	_X_	_X_	_X_
Double Wall					

9. Tank Leak Detection (Mark all that apply)					
a. Monthly Monitoring					
Manual Tank Guaging	___	___	___	___	___
Automatic Tank Guaging	___	___	___	___	___
Vapor Monitoring	___	___	___	___	___
Ground-Water Monitoring	___	___	___	___	___
Interstitial Monitoring	___	___	___	___	___
b. Annual Tank Tightness Testing & Monthly Inventory Control	___	___	___	___	___
c. Tightness Testing Every 5 yrs & Monthly Inventory Control	___	___	___	___	___
None	___	___	___	___	___
Unknown	_X_	_X_	_X_	_X_	_X_
Other, Please Specify	_____	_____	_____	_____	_____
10. Pipe Leak Detection (Mark all that apply)					
a. Pressurized Piping					
Automatic Flow Restrictor	___	___	___	___	___
Automatic Shutoff Device	___	___	___	___	___
Continuous Alarm System	___	___	___	___	___
Annual Line Testing	___	___	___	___	___
b. Suction Piping					
Line Testing Every 3 yrs	___	___	___	___	___
c. Either Type					
Monthly Monitoring	___	___	___	___	___
None	___	___	___	___	___
Unknown	_X_	_X_	_X_	_X_	_X_
Other, Please Specify	_____	_____	_____	_____	_____
11. Tank Corrosion Protection (Mark all that apply)					
a. Internal					
Cathodic Protection	___	___	___	___	___
Interior Lining	___	___	___	___	___
None	_X_	_X_	_X_	_X_	_X_
Unknown	___	___	___	___	___
Other, Please Specify	_____	_____	_____	_____	_____
b. External					
Cathodic Protection	___	___	___	___	___
Painted (e.g. asphaltic)	_X_	_X_	_X_	_X_	_X_
Steel Clad with Fiberglass Reinforced Plastic Coated	___	___	___	___	___
None	___	___	___	___	___
Unknown	___	___	___	___	___
Other, Please Specify	_____	_____	_____	_____	_____

12. Piping Corrosion Protection (Mark all that apply)					
Painted	___	___	___	___	___
Cathodic Protection	___	___	___	___	___
Fiberglass Reinforced Plastic Coated	___	___	___	___	___
None	___	___	___	___	___
Unknown	_X_	_X_	_X_	_X_	_X_
Other	___	___	___	___	___
13. Spill/Overfill Protection (Mark all that apply)					
Catchment Basin	___	___	___	___	___
Overfill Alarm	___	___	___	___	___
Automatic Shutoff Device	___	___	___	___	___
Ball Float Valves	___	___	___	___	___
None	___	___	___	___	___
Unknown	_X_	_X_	_X_	_X_	_X_
Other, Please Specify	___	___	___	___	___
14. Substance Currently or Last Stored in Greatest Volume (Mark all that apply)					
Empty	___	___	___	___	___
Petroleum Product					
Diesel	___	___	___	___	___
Kerosene	___	___	___	___	___
Gasoline (including alcohol blends)	_X_	_X_	_X_	___	___
Used Oil	___	___	___	___	___
Other, Please Specify	___	___	___	HEAT - OIL#6	HEAT - OIL#6
Hazardous Substance	___	___	___	___	___
Indicate Principal CERCLA Substance	___	___	___	___	___
Chemical Abstract Service (CAS) No.	___	___	___	___	___
Mixture	___	___	___	___	___
Unknown	___	___	___	___	___
15. Date Tank Last Tested (mo/yr)	___	___	___	___	___
16. Date Piping Last Tested (mo/yr)	___	___	___	___	___
17. Indicate if Leaking (Mark all that apply) Tank	___	___	___	___	___
Piping	___	___	___	___	___
18. Regulator (Mark all that apply) Federal	___	___	___	___	___
State	___	___	___	___	___
Local	___	___	___	___	___
Deferred	___	___	___	___	___
None	___	___	___	___	___

19. Tank Compliance (Mark all that apply)					
Passed	___	___	___	___	___
Admin. Problem	___	___	___	___	___
Problem Requiring a Project	___	___	___	___	___
Unknown	_X_	_X_	_X_	_X_	_X_
20. Piping Compliance (Mark all that apply)					
Passed	___	___	___	___	___
Admin. Problem	___	___	___	___	___
Problem Requiring a Project	___	___	___	___	___
Unknown	_X_	_X_	_X_	_X_	_X_
21. Served Notice of Violation? (Mark if in violation)					
Tank	___	___	___	___	___
Piping	___	___	___	___	___
22. Permits (Mark one)					
Not Required	___	___	___	___	___
On Hand	___	___	___	___	___
Applied For	___	___	___	___	___
Required - Don't Have	___	___	___	___	___

Additional Remarks to be included for each tank.

Tank No. A57 : _____

Tank No. A71 : _____

Tank No. A72 : _____

Tank No. E38 : _____

Tank No. E39 : _____

IV. DESCRIPTION OF UNDERGROUND STORAGE TANKS
(Complete for each tank at this location.)

Tank Identification No. (Assigned Sequential Number) (e.g. 1,2,3 . . .)	Tank # No. E40	Tank # No. E56	Tank # No. E58	Tank # No. E59	Tank # No. E60
1. Status of Tank (Mark One) Currently in Use	_X_	_X_	_X_	_X_	_X_
Temporarily Out of Use	___	___	___	___	___
Permanently Out of Use	___	___	___	___	___
Replaced	___	___	___	___	___
Extracted	___	___	___	___	___
2. Additional Information (for tanks taken out of service)					
a. Estimated date last used (mo/yr)	_____	_____	_____	_____	_____
b. Estimated quantity of substance remaining (gal)	_____	_____	_____	_____	_____
c. Mark if tank closed in accordance with EPA guidelines	___	___	___	___	___
3. Estimated Installation Date (Yr)	1960	1966	1966	1965	1965
4. Estimated Total Capacity (Gal.)	25000	2000	5000	5000	5000
5. Tank Material of Construction (Mark One) Steel	_X_	_X_	_X_	_X_	_X_
Concrete	___	___	___	___	___
Fiberglass Reinforced Plastic	___	___	___	___	___
Unknown	___	___	___	___	___
Other, Please Specify	_____	_____	_____	_____	_____
6. Piping Material of Construction (Mark One) Bare Steel	_X_	_X_	_X_	_X_	_X_
Galvanized Steel	___	___	___	___	___
Fiberglass Reinforced Plastic	___	___	___	___	___
Unknown	___	___	___	___	___
Other, Please Specify	_____	_____	_____	_____	_____
7. Tank Construction (Mark One) Single Wall	_X_	_X_	_X_	_X_	_X_
Double Wall	___	___	___	___	___
8. Pipe Construction (Mark One) Single Wall	_X_	_X_	_X_	_X_	_X_
Double Wall	___	___	___	___	___

9. Tank Leak Detection (Mark all that apply)					
a. Monthly Monitoring					
Manual Tank Guaging	___	___	___	___	___
Automatic Tank Guaging	___	___	___	___	___
Vapor Monitoring	___	___	___	___	___
Ground-Water Monitoring	___	___	___	___	___
Interstitial Monitoring	___	___	___	___	___
b. Annual Tank Tightness Testing & Monthly Inventory Control	___	___	___	___	___
c. Tightness Testing Every 5 yrs & Monthly Inventory Control	___	___	___	___	___
None	___	___	___	___	___
Unknown	_X_	_X_	_X_	_X_	_X_
Other, Please Specify	_____	_____	_____	_____	_____
10. Pipe Leak Detection (Mark all that apply)					
a. Pressurized Piping					
Automatic Flow Restrictor	___	___	___	___	___
Automatic Shutoff Device	___	___	___	___	___
Continuous Alarm System	___	___	___	___	___
Annual Line Testing	___	___	___	___	___
b. Suction Piping					
Line Testing Every 3 yrs	___	___	___	___	___
c. Either Type					
Monthly Monitoring	___	___	___	___	___
None	___	___	___	___	___
Unknown	_X_	_X_	_X_	_X_	_X_
Other, Please Specify	_____	_____	_____	_____	_____
11. Tank Corrosion Protection (Mark all that apply)					
a. Internal					
Cathodic Protection	___	___	___	___	___
Interior Lining	___	___	___	___	___
None	_X_	_X_	_X_	_X_	_X_
Unknown	___	___	___	___	___
Other, Please Specify	_____	_____	_____	_____	_____
b. External					
Cathodic Protection	___	___	___	___	___
Painted (e.g. asphaltic)	_X_	_X_	_X_	_X_	_X_
Steel Clad with Fiberglass	___	___	___	___	___
Fiberglass Reinforced Plastic Coated	___	___	___	___	___
None	___	___	___	___	___
Unknown	___	___	___	___	___
Other, Please Specify	_____	_____	_____	_____	_____

12. Piping Corrosion Protection (Mark all that apply)					
Painted					
Cathodic Protection					
Fiberglass Reinforced Plastic Coated					
None					
Unknown	X	X	X	X	X
Other					
13. Spill/Overfill Protection (Mark all that apply)					
Catchment Basin					
Overfill Alarm					
Automatic Shutoff Device					
Ball Float Valves					
None					
Unknown	X	X	X	X	X
Other, Please Specify					
14. Substance Currently or Last Stored in Greatest Volume (Mark all that apply)					
Empty					
Petroleum Product					
Diesel			X		X
Kerosene					
Gasoline (including alcohol blends)				X	
Used Oil					
Other, Please Specify	HEAT - OIL#6	HEAT - OIL#6	#2-D		#2-D
Hazardous Substance					
Indicate Principal CERCLA Substance					
Chemical Abstract Service (CAS) No.					
Mixture					
Unknown					
15. Date Tank Last Tested (mo/yr)					
16. Date Piping Last Tested (mo/yr)					
17. Indicate if Leaking Tank					
(Mark all that apply) Piping					
18. Regulator Federal					
(Mark all that apply) State					
Local					
Deferred					
None					

19. Tank Compliance (Mark all that apply)					
Passed	___	___	___	___	___
Admin. Problem	___	___	___	___	___
Problem Requiring a Project	___	___	___	___	___
Unknown	_X_	_X_	_X_	_X_	_X_
20. Piping Compliance (Mark all that apply)					
Passed	___	___	___	___	___
Admin. Problem	___	___	___	___	___
Problem Requiring a Project	___	___	___	___	___
Unknown	_X_	_X_	_X_	_X_	_X_
21. Served Notice of Violation? (Mark if in violation)					
Tank	___	___	___	___	___
Piping	___	___	___	___	___
22. Permits (Mark one)					
Not Required	___	___	___	___	___
On Hand	___	___	___	___	___
Applied For	___	___	___	___	___
Required - Don't Have	___	___	___	___	___

Additional Remarks to be included for each tank.

Tank No. E39 : _____

Tank No. E40 : _____

Tank No. E56 : _____

Tank No. E58 : _____

Tank No. E59 : _____

IV. DESCRIPTION OF UNDERGROUND STORAGE TANKS
(Complete for each tank at this location.)

Tank Identification No. (Assigned Sequential Number) (e.g. 1,2,3 . . .)	Tank # No. E60	Tank # No. E61	Tank # No. E62	Tank # No.	Tank # No.
1. Status of Tank (Mark One) Currently in Use	_X_	_X_	_X_	___	___
Temporarily Out of Use	___	___	___	___	___
Permanently Out of Use	___	___	___	___	___
Replaced	___	___	___	___	___
Extracted	___	___	___	___	___
2. Additional Information (for tanks taken out of service)					
a. Estimated date last used (mo/yr)	_____	_____	_____	_____	_____
b. Estimated quantity of substance remaining (gal)	_____	_____	_____	_____	_____
c. Mark if tank closed in accordance with EPA guidelines	___	___	___	___	___
3. Estimated Installation Date (Yr)	1965	1972	1969		
4. Estimated Total Capacity (Gal.)	5000	6000	5000		
5. Tank Material of Construction (Mark One) Steel	_X_	_X_	_X_	___	___
Concrete	___	___	___	___	___
Fiberglass Reinforced Plastic	___	___	___	___	___
Unknown	___	___	___	___	___
Other, Please Specify	_____	_____	_____	_____	_____
6. Piping Material of Construction (Mark One) Bare Steel	_X_	_X_	_X_	___	___
Galvanized Steel	___	___	___	___	___
Fiberglass Reinforced Plastic	___	___	___	___	___
Unknown	___	___	___	___	___
Other, Please Specify	_____	_____	_____	_____	_____
7. Tank Construction (Mark One) Single Wall	_X_	_X_	_X_	___	___
Double Wall	___	___	___	___	___
8. Pipe Construction (Mark One) Single Wall	_X_	_X_	_X_	___	___
Double Wall	___	___	___	___	___

9. Tank Leak Detection (Mark all that apply)					
a. Monthly Monitoring					
Manual Tank Guaging	___	___	___	___	___
Automatic Tank Guaging	___	___	___	___	___
Vapor Monitoring	___	___	___	___	___
Ground-Water Monitoring	___	___	___	___	___
Interstitial Monitoring	___	___	___	___	___
b. Annual Tank Tightness Testing & Monthly Inventory Control	___	___	___	___	___
c. Tightness Testing Every 5 yrs & Monthly Inventory Control	___	___	___	___	___
None	___	___	___	___	___
Unknown	_X_	_X_	_X_	___	___
Other, Please Specify	_____	_____	_____	_____	_____
10. Pipe Leak Detection (Mark all that apply)					
a. Pressurized Piping					
Automatic Flow Restrictor	___	___	___	___	___
Automatic Shutoff Device	___	___	___	___	___
Continuous Alarm System	___	___	___	___	___
Annual Line Testing	___	___	___	___	___
b. Suction Piping					
Line Testing Every 3 yrs	___	___	___	___	___
c. Either Type					
Monthly Monitoring	___	___	___	___	___
None	___	___	___	___	___
Unknown	_X_	_X_	_X_	___	___
Other, Please Specify	_____	_____	_____	_____	_____
11. Tank Corrosion Protection (Mark all that apply)					
a. Internal					
Cathodic Protection	___	___	___	___	___
Interior Lining	___	___	___	___	___
None	_X_	_X_	_X_	___	___
Unknown	___	___	___	___	___
Other, Please Specify	_____	_____	_____	_____	_____
b. External					
Cathodic Protection	___	___	___	___	___
Painted (e.g. asphaltic)	_X_	_X_	_X_	___	___
Steel Clad with Fiberglass	___	___	___	___	___
Fiberglass Reinforced Plastic Coated	___	___	___	___	___
None	___	___	___	___	___
Unknown	___	___	___	___	___
Other, Please Specify	_____	_____	_____	_____	_____

12. Piping Corrosion Protection (Mark all that apply)					
Painted	___	___	___	___	___
Cathodic Protection	___	___	___	___	___
Fiberglass Reinforced Plastic Coated	___	___	___	___	___
None	___	___	___	___	___
Unknown	_X_	_X_	_X_	___	___
Other	___	___	___	___	___
13. Spill/Overfill Protection (Mark all that apply)					
Catchment Basin	___	___	___	___	___
Overfill Alarm	___	___	___	___	___
Automatic Shutoff Device	___	___	___	___	___
Ball Float Valves	___	___	___	___	___
None	___	___	___	___	___
Unknown	_X_	_X_	_X_	___	___
Other, Please Specify	___	___	___	___	___
14. Substance Currently or Last Stored in Greatest Volume (Mark all that apply)					
Empty	___	___	___	___	___
Petroleum Product					
Diesel	_X_	___	___	___	___
Kerosene	___	___	___	___	___
Gasoline (including alcohol blends)	___	_X_	___	___	___
Used Oil	___	___	___	___	___
Other, Please Specify	#2-D	___	HEAT - OIL#2	___	___
Hazardous Substance	___	___	___	___	___
Indicate Principal CERCLA Substance	___	___	___	___	___
Chemical Abstract Service (CAS) No.	___	___	___	___	___
Mixture	___	___	___	___	___
Unknown	___	___	___	___	___
15. Date Tank Last Tested (mo/yr)	___	___	___	___	___
16. Date Piping Last Tested (mo/yr)	___	___	___	___	___
17. Indicate if Leaking (Mark all that apply) Tank	___	___	___	___	___
Piping	___	___	___	___	___
18. Regulator (Mark all that apply) Federal	___	___	___	___	___
State	___	___	___	___	___
Local	___	___	___	___	___
Deferred	___	___	___	___	___
None	___	___	___	___	___

19. Tank Compliance (Mark all that apply)					
Passed	___	___	___	___	___
Admin. Problem	___	___	___	___	___
Problem Requiring a Project	___	___	___	___	___
Unknown	_X_	_X_	_X_	___	___
20. Piping Compliance (Mark all that apply)					
Passed	___	___	___	___	___
Admin. Problem	___	___	___	___	___
Problem Requiring a Project	___	___	___	___	___
Unknown	_X_	_X_	_X_	___	___
21. Served Notice of Violation? (Mark if in violation)					
Tank	___	___	___	___	___
Piping	___	___	___	___	___
22. Permits (Mark one)					
Not Required	___	___	___	___	___
On Hand	___	___	___	___	___
Applied For	___	___	___	___	___
Required - Don't Have	___	___	___	___	___

Additional Remarks to be included for each tank.

Tank No. E59 : _____

Tank No. E60 : _____

Tank No. E61 : _____

Tank No. : _____

Tank No. : _____

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